

Seán L. Hill
ave Alexandre-Vinet 29
Lausanne CH-1004
Switzerland

T +41 21 693 9678
F +41 21 693 1800
M +41 78 729 9459
sean.hill@epfl.ch

PERSONAL:

Citizenship: USA
Languages: English, French

EDUCATION:

University of Lausanne, Switzerland Ph.D. 2000 Computational Neuroscience
Thesis: "*Spatial and temporal processing in large-scale thalamocortical neural networks*"

University of Missouri, Kansas City 1992 - 1993 Mathematical Statistics and Logic

Hampshire College, Amherst, MA B.A. 1992 Computational Neuroscience
Thesis: "*Spatiotemporal self-organization in a long-range reaction-diffusion model of neural processing*"

WORK EXPERIENCE:

2008 - present: **Project Manager for Computational Neuroscience**

Blue Brain Project - Brain Mind Institute
EPFL - École Fédérale Polytechnique de Lausanne, Switzerland.

2006 - 2008: **Project Manager for Computational Neuroscience**

Blue Brain Project - IBM Research
IBM T.J. Watson Research Center, New York, USA.
IBM Zürich Research Laboratory, Switzerland.

2001 - 2006: **Research Associate in Theoretical and Computational Neuroscience**

Mentor: Giulio Tononi, MD, PhD
Department of Psychiatry, University of Wisconsin, Madison.

1999 - 2001: **Fellow in Theoretical Neurobiology**

The Neurosciences Institute, La Jolla, California.

1996 - 1999: **Research assistant, Hybrid neural and expert systems**

Hautes Études Commerciales, University of Lausanne, Switzerland.

1992 - 1994: **Director of Software Development, Senior Software Engineer - Clinical trials**

Ergoscience, Inc., Charlestown, Massachusetts.

1993: **Consultant - Medical Software Technology**

Massachusetts General Hospital, Boston, Massachusetts.

1991: **Undergraduate Research Fellow**

Research in Intelligent Systems, Kohonen self-organizing neural networks
The American University, Washington, DC.

1990 - 1991: **Consultant/Mathematical Modeler - Mosquito populations and disease vectors**

EcoScience, Inc., Amherst, Massachusetts.

1990: **Undergraduate Research Fellow:**

Central Pattern Generators in *Helisoma Trivolvis* - Intracellular recordings
The Howard Hughes Medical Institute, Hampshire College, Amherst, MA.

MAJOR SERVICE, AWARDS & HONORS:

- 2009 INCF Task Force for a Standard Language in Neural Network Modeling
International Neuroinformatics Coordinating Facility. Member of Task Force.
- 2009 INCF NeuroML Development Workshop
- 2008 Organizer/Chairperson Federation of European Neuroscience: Special Event:
The Blue Brain Project. Forum of European Neuroscience, Geneva.
- 2008 Organizer/Chairperson. Federation of European Neuroscience
Satellite Meeting: The Blue Brain Project. PalEXPO Center, Geneva.
- 2007 Organizer/Chairperson. Society for Neuroscience Minisymposium:
Thalamocortical interactions in health and disease: from ion channels to
large-scale networks.
- 2002 Swartz Foundation Fellowship in Computational Neuroscience
- 1994 - 1997 Swiss National Science Foundation Fellowship
- 1991 National Science Foundation Undergraduate Research Fellow
- 1990 Howard Hughes Medical Institute Undergraduate Research Fellow

PROJECTS

Synthesis - www.synthesis-simulator.com

Large-scale complex systems simulator

Designer and developer of a general purpose software program for simulating large-scale neuronal networks.

SOCIETY MEMBERSHIPS:

IEEE

Swiss Society for Neuroscience

The Society for Neuroscience

TEACHING EXPERIENCE:

MS Students: Aurélien Mace, Thomas Tränkler

2006 - 2008: Lectures on Synaptic plasticity, Neurophysiology, Neural modeling
Brain Mind Institute, EPFL, Lausanne, Switzerland

1994 - 1997: Teaching Assistant, Physiology lab
Department of Physiology, University of Lausanne, Switzerland.

1990 - 1992: Teaching Assistant, Neurophysiology lab
Hampshire College, Amherst, Massachusetts.

PUBLICATIONS

King, J.G., Hines M., Hill S., Goodman P.H., Markram H. and Schürmann F. (2009) A Component-Based Extension Framework for Large-Scale Parallel Simulations in NEURON. **Frontiers in Neuroinformatics**. doi:10.3389/neuro.11.010.2009.

Talavera, J.A., Esser, S.K., Amzica, F., Hill, S. and Antognini, J. (2009) Modeling the Gabaergic Action of Etomidate on the Thalamocortical System. **Anesthesia and Analgesia**, vol. 108 (1):160-7.

Druckmann, S., Berger, T.K., Hill, S.L., Schürmann, F., Markram, H. and Segev, I. (2008) Evaluating automated parameter constraining procedures of neuron models by experimental and surrogate data. **Biological Cybernetics**, vol. 99 (4-5): 371-379.

Hill, S.L., Tononi, G. and Ghilardi, M.F. (2008) Sleep improves the variability of motor performance. **Brain Research Bulletin**. 76:605-611.

Kozloski, J., Sfyarakis, K., Hill, S.L., Schürmann, F. and Markram, H. (2008) Identifying, tabulating, and analyzing contacts between branched neuron morphologies. **IBM Journal of Research and Development**. Special issue on "Applications of Massively Parallel Systems", Vol 12(1-2): 43-56. *cover image*

Esser, S.K., Hill, S.L.* and Tononi G. (2007) Sleep homeostasis, slow waves and cortical synchronization: I. Modeling how synaptic strength determines slow wave synchrony. **Sleep**, Dec 1; 30(12):1617-1630.

Cirelli C., Bushey, D., Hill S.L., Huber R., Kreber, B., Ganetzky, B. and Tononi, G. (2005) Reduced sleep in *Drosophila Shaker* mutants. **Nature**, 434, 1087-1092.

Esser, S.K., Hill, S.L. and Tononi G. (2005) Modeling the effects of transcranial magnetic stimulation on cortical circuits. **Journal of Neurophysiology**, E-pub: March 23, 2005.

Hill, S.L. and Tononi G. (2004) Modeling sleep and wakefulness in the thalamocortical system. **Journal of Neurophysiology**, Nov 10. 93(3): 1671-1698. - *Featured in Nature Neuroscience Reviews Jan 2005*.

Massimini M., Huber R., Ferrarelli F., Hill, S.L. and Tononi G. (2004) The sleep slow oscillation as a traveling wave. **Journal of Neuroscience**, Aug 4;24(31):6862-70.

Huber, R., Hill, S.L., Holladay, C., Biesiadecki, M., Tononi, G. and Cirelli, C. (2004) Sleep homeostasis in *Drosophila melanogaster*. **Sleep**, Jun 15;27(4):628-39.

Hill, S.L. and Villa, A.E. (1997). Dynamic transitions in global network activity influenced by the balance of excitation and inhibition. **Network: Computation in Neural Systems**, 8(2):164-184.

BOOK CHAPTERS

Anwar, H., Riachi, I., Hill, S.L., Schürmann, F. and Markram, H. (2009) Capturing neuron morphological diversity. In *Computational Neuroscience: Realistic Modeling for Experimentalists*, 2nd edition, edited by Eric De Schutter.

Peck, C., Kozloski, J., Cecchi, G., Hill, S., Schürmann, F., Markram, H. and Rao, R. (2008) Network-Related Challenges and Insights from Neuroscience. *Lecture Notes in Computer Science: Bio-Inspired Computing and Communication*. Springer Berlin. pp 67-78.

Hill, S.L. and Tononi, G. (2002) Thalamus. In: *The Handbook of Brain Theory and Neural Networks*, 2nd edition. Boston: MIT Press. 1176-1179.

Hill, S.L. and Villa, A.E. (1995). Global spatio-temporal activity influenced by local kinetics in a simulated "cortical" neural network. In Herrmann, H., Wolf, D., and Pöppel, E., editors, *Supercomputing in Brain Research*, pages 371-378, Singapore. HLRZ, KFA Jülich, World Scientific Publishing.

THESES

Hill, S.L. (2000) Spatial and temporal processing in large-scale thalamocortical neural networks. PhD Thesis. University of Lausanne, Switzerland.

Hill, S.L. (1992) Spatiotemporal self-organization in a long-range reaction-diffusion model of neural processing. Division III (Undergraduate thesis). Hampshire College, Amherst, Massachusetts.

INVITED TALKS/LECTURES

June, 2009. Complex Dynamics in Large-Scale Interacting Brain Systems: Towards Physical Models of Sleep and Consciousness, Max-Planck-Institut für Physik komplexer Systeme, Dresden, Germany.

April, 2009. Wiring the Brain, County Limerick, Ireland.

* joint first authorship

March, 2009. 7th Systems Neurobiology Spring School 2009 (SNSS 2009), Kyoto City, Japan.

September, 2008. Computation in Cortical Circuits, Ascona, Switzerland.

September, 2008. Imaging Brain Function: From Synapses to Networks, PENS (FENS/IBRO) Training Center, Lausanne, Switzerland.

August, 2008. 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Vancouver, Canada.

July, 2008. FENS Special Event: The Blue Brain Project. Forum of European Neuroscience, Geneva, Switzerland.

July, 2008. FENS Satellite Meeting: The Blue Brain Project. PalEXPO Center, Geneva, Switzerland.

March, 2008. Simpósium Internacional de Sistemas Computacionales y Tecnologías de Información (SISCTI 33), Monterrey, Mexico.

November, 2007. Society for Neuroscience Minisymposium. *Modeling Sleep and Wakefulness in the Thalamocortical System.* San Diego, California.

November, 2007. Max Planck Institute for Ornithology, Seewiesen, Germany. *Modeling Slow Wave Sleep and Synaptic Homeostasis in the Thalamocortical System.*

July, 2007. 16th Annual Computational Neuroscience Meeting, Toronto, Canada. July 12, 2007. *A Model of Wakefulness and Sleep in the Visual Thalamocortical System*

June, 2007. Human Integrative Physiology Seminar, University of Zürich, Switzerland. June 19, 2007. *The Blue Brain Project: Reverse-engineering the neocortical column.*

January, 2007. University of Zürich, Switzerland. *Modeling Sleep and Synaptic Homeostasis in the Thalamocortical System.*

October, 2006. Mathematical Biosciences Institute (MBI), Ohio State University: New Approaches to Modeling Sleep/Wake Dynamics and Cognitive Performance.

June, 2005. APSS Denver: Computational Modeling Of Sleep And Circadian Rhythms: From Molecules To Behavior. *A Computational Model Of Sleep And Wakefulness In The Thalamocortical System.*

October, 2004. Honda Research Institute, Offenbach, Germany. *A large-scale model of sleep and wakefulness in the thalamocortical system.*

September, 2001. PSYCH 622 - "Biology of Mind" Invited lecture on Systems Neuroscience. University of Wisconsin, Madison.

April, 1999. MANTRA, *Modeling large-scale thalamocortical networks.* Presentation of simulation results and research, EPFL Lausanne, Switzerland.

P R E S S

Jones, R. (2005) [Electric Dreams](#), Nature Reviews Neuroscience 6, 3 (2005); doi: 10.1038/nrn1592

Gibson, B. (2003) The Brawn Behind Brain Research. Apple Computer www.apple.com/education/hed/macsinaction/wisconsin/.

PUBLISHED ABSTRACTS AND CONFERENCE PRESENTATIONS

Hill, S.L. and Markram, H. "The Blue Brain Project". Engineering in Medicine and Biology Society. EMBS 2008. 30th Annual International Conference of the IEEE, Vancouver, Canada, 2008.

Gidon, A., Hill, S.L., Schürmann, F., Markram, H. and Segev, I. (2008) Shaping the response of Layer 5 cortical pyramids by Martinotti inhibition – an experimentally-based modeling study. 6th Forum of European Neuroscience, Geneva, 2008.

Khazen, G., Hill, S.L., Schürmann, F., Goodman, P. and Markram, H. (2008) Recreating the ion channel diversity underlying morpho-electrical subtypes of neocortical neurons. 6th Forum of European Neuroscience, Geneva, 2008.

Anwar, H., Riachi, I., Hill, S.L., Schürmann, F. and Markram, H. (2008) Repairing 3D morphological models obtained from in vitro experiments. 6th Forum of European Neuroscience, Geneva, 2008.

Riachi, I., Hill, S.L., Schürmann, F. and Markram, H. (2008) Modeling Experimental Sampling. 6th Forum of European Neuroscience, Geneva, 2008.

Sfyarakis, K., Chapochnikov, N., Hill, S.L., Jan, A., Kozloski, J., Riachi, I., Schürmann, F. and Markram, H. (2008) Constructing, Connecting and Validating a Model Neocortical Column in 3D Space. 6th Forum of European Neuroscience, Geneva, 2008.

Ranjan, R., Hill, S.L., Ramaswamy, R., Druckmann, S., Schürmann, F. and Markram, H. (2008) Biophysical characterization of genetically-expressed ion channels to generate standardized and parameters for realistic ion channel models. 6th Forum of European Neuroscience, Geneva, 2008.

Hill, S.L., Druckmann, S., Gidon, A., Hay, E., King, J.G., Ramswamy, S., Ranjan, R., Riachi, I., Sfyarakis, K., Schürmann, F., and Markram, H. (2008) Calibrating and Validating the Biological Accuracy of a Model Neocortical Column: From ion channels to network dynamics. 6th Forum of European Neuroscience, Geneva, 2008.

Druckmann, S., Hill, S.L., Schürmann, F., Markram, H. and Segev, I. (2008) Quantifying and Modeling the Diversity of Neocortical Interneurons. 6th Forum of European Neuroscience, Geneva, 2008.

Ramaswamy, S., Hill, S.L., King, J.G., Riachi, I., Schürmann, F. and Markram, H. (2008) Calibrating and Validating Monosynaptic Connections and Pathways in a Model Neocortical Column. 6th Forum of European Neuroscience, Geneva, 2008.

Hill, S.L., Ramaswamy, S., Ranjan, R., Srinivasan, K., Riachi, K., Chapochnikov, N., Mace, A., Tränkler, T., Druckman, S., Hay, E., Gidon, A., Schürmann, F. and Markram, H. (2007) The Blue Brain Project: Calibrating a model of the neocortical column. Society for Neuroscience Abstracts, 2007.

Ranjan, R., Ramaswamy, S., Druckmann, S., Gidon, A., Goodman, P., Hay, P., Hill, S.L., Schürmann, F. and Markram, H. (2007) Blue Brain Project: Capturing parameters from genetically prescribed ion channels for neuron modeling. Society for Neuroscience Abstracts, 2007.

Riachi, I., Anwar, H., Garcia-Alvarez, S., Hill, S.L., Jan, A., LeBe, J.V., Sefton, B., Schürmann, F., Srinivasan, F., Wang, Y. and Markram, H. (2007) The Blue Brain Project: Single Neuron Morphology Workflow Capturing morphological diversity for neuronal modeling. Society for Neuroscience Abstracts, 2007.

Sfyrakis, K., Kozloski, J., Jan, A., Bao, J., Chapochnikov, N., Riachi, I., Hill, S.L., Schürmann, F. and Markram, H. (2007) The Blue Brain Project: Automating the construction of the model neocortical column. Society for Neuroscience Abstracts, 2007.

Schürmann, F., Hines, M., Ranjan, R., Ramaswamy, S., Rodriguez, A., Lasserre, S., King, J.G., Traenkler, T., Hernando, J., de Heras, P., Hill, S.L. and Markram, H. (2007) Blue Brain Project: Simulating a large-scale network of morphologically complex neurons. Society for Neuroscience Abstracts, 2007.

Druckmann, S., Gidon, A., Hay, E., Hill, S.L., Jan, A., Mace, A., Ramaswamy, S., Ranjan, R., Rodriguez, A., Schürmann, F., Markram, H. and Segev, I. (2007) The Blue Brain Project: Single Neuron Modeling. Society for Neuroscience Abstracts, 2007.

Hill, S.L., Ranjan, R., Ramaswamy, S., Druckmann, S., Gidon, A., Bao, J., Riachi, I., Schürmann, F. and Markram, H. (2007) The Blue Brain Project: Calibrating the neocortical column. 16th Annual Computational Neuroscience Meeting, Toronto, Canada. July 12, 2007.

Schürmann, F., Hill, S.L. and Markram, H. (2007) The Blue Brain Project: Building the neocortical column. 16th Annual Computational Neuroscience Meeting, Toronto, Canada. July 12, 2007.

Jolivet, R., Schürmann, F., Hill, S., Ranjan, R., Pellerin, L., Markram, H. and Magistretti, P. (2006) Modeling neuron-glia interactions: from Hodgkin-Huxley to neurometabolic coupling and back. 7th International Conference on Brain Energy Metabolism. EPFL, Lausanne, Switzerland 2006.

King, J.G., Schürmann, F., Hill, S.L. and Markram, H. (2006) BlueEnvironment: Enabling Real-Time Interaction with Biologically Complex Models of the Neocortical Column. 5th Forum of European Neuroscience - Vienna 2006.

Sfyrakis, K., Langen, C., King, J.G., Jan, A., Lasserre, S., Anwar, H., Ranjan, R., Hill, S.L., Schürmann and Markram, (2006) H. Blue Builder: Building the Neocortical Column According to Recipe. 5th Forum of European Neuroscience - Vienna 2006.

Hill, S.L. and Tononi G. (2006) Sleep homeostasis, slow waves and cortical synchronization: I. Modeling how synaptic strength determines slow wave synchrony. APSS Salt Lake City.

Hill S.L., Ghilardi M.F., and Tononi G. (2005) Synaptic Homeostasis in a Model of Wakefulness and Sleep. Program No. 314.7. 2005. Washington, DC: Society for Neuroscience.

Hill, S.L. and Tononi G. (2005) Modeling Synaptic Homeostasis in Wakefulness and Sleep. APSS Denver.

Massimini, M., Esser, S., Ferrarelli, F., Hill, S.L., Huber, R., Peterson, M. and Tononi G. (2004) Effective Connectivity Of The Human Cerebral Cortex In Sleep And Wakefulness: A TMS/EEG STUDY Program No. 196.3. Washington, DC: Society for Neuroscience.

Hill, S.L. and Tononi G. (2004) A large-scale computer model of sleep and wakefulness in thalamocortical circuitry. *Journal of Sleep Research* Vol 13(S1):322.

Massimini, M., Huber, R., Ferrarelli F., Hill, S.L., Mariotti, M., Tononi, G. (2004) The sleep slow oscillation is a traveling wave. *Journal of Sleep Research* Vol 13(S1):485

Hill, S.L. and Tononi G. (2004) Modeling wakefulness and sleep in a large-scale thalamocortical model. *Sleep* 27: 23-24 052 Suppl.

Hill, S.L., Massimini M., Esser S.K. and Tononi G. (2003) Simulating cortical TMS during sleep and wakefulness. *Sleep* 26, Abstr. Suppl.

Biesiadecki, M., Huber R., Holladay C., Hill S.L., Tononi G., Cirelli C. (2003) Sleep homeostasis in the fruit fly. *Sleep* 26, Abstr. Suppl.

Holladay C., Huber R., Biesiadecki M., Martinez-Gonzalez D., Hill S.L., Kreber R., Ganetzky B., Tononi, G., Cirelli C. (2003) Natural variation in the sleep phenotype in *Drosophila melanogaster*. *Sleep* 26, Abstr. Suppl.

Cirelli, C., Hill S.L., Holladay C., Biesiadecki M., Martinez-Gonzalez D., Kreber R., Ganetzky B., Tononi, G. (2003) Sleep in *Drosophila melanogaster*: a mutagenesis screening. *Sleep* 26, Abstr. Suppl.

Martinez-Gonzalez D., Fahy J., Holladay C., Hill S.L., Kreber R., Ganetzky B., Tononi G., Cirelli C., Benca R. (2003) Light effects on the sleep pattern in *Drosophila melanogaster*. *Sleep* 26, Abstr. Suppl.

Hill, S.L., Habeck, C.G., Edelman, G.M. and Tononi, G. (2001) The dynamics of sleep and waking in a large-scale computer model of the thalamocortical system. 15th Annual meeting of the APSS, Chicago.

Habeck, C.G., Hill, S.L., Edelman, G.M. and Tononi, G. (2000) Simulating the dynamics of sleep and waking in a large-scale model of the cat thalamocortical system. *Soc. Neurosci. Abstracts*, Vol 26.

Hill, S.L. and Villa, A.E. (1998). Corticofugal projections dynamically reorganize activity in large-scale thalamocortical simulations. *Proc. 26th Göttingen Neurobiology Conference*, Springer-Verlag/Berlin.

Hill, S.L. and Wentland, M. (1998) "Implementing a Hybrid Architecture for Artificial Neural Network Applications", in *Proc. of ICANN'98*, Skövde (Sweden), Sept. 1st-5th 1998.

Hill, S.L. and M. Wentland (1998) OPHELIA, Object-oriented Pedagogical Hypertext Editor for Learning, Instruction and Authoring"

Hill, S.L. and M. Wentland, in *Proc. of Hypermedia et Apprentissage*, Poitiers (France), 15-17 October 1998.

Hill, S.L. and M. Wentland (1998) Datamining Financial Data using a Hybrid System for Artificial Neural Network Applications, in *Proc. of SIGEF'98*, November 24-27th 1998, EPFL, Lausanne (Switzerland)

Hill, S.L. and M. Wentland (1997) HANNA: Hybrid architecture for artificial neural network applications. *IOS Frontiers In Artificial Intelligence And Applications Series: Advances in intelligent systems*, 394 - 399.

Swiss IBRO, January 1996. Poster presentation, Geneva, Switzerland.

Conference and Workshop on Neural Networks, Poster presentation, Würzburg, Germany, October 1995.

Course in Molecular Biology and Neuroscience, July 2 - 8, 1995. Oral presentation of simulations and poster presentation, Cividale, Italy.

Conference on Neural Network Modeling and Neuroscience, April, 1995. Poster presentation, Lyon, France.

27th Annual Meeting of the USGEB/USSBE, March 30 - 31, 1995. Poster presentation, Fribourg, Switzerland

Swiss IBRO, January 1995. Poster presentation. Bern, Switzerland.

CARNAC, December 1994. UNIL/EPFL, Oral presentation of simulation results and research, Lausanne, Switzerland.

Hill, S.L. (1994). COELACANTH: A neuro-simulator. Technical Report FNRS 31-377723.93, Swiss National Science Foundation, Bern, Switzerland.